Texturas Albert y Ferran Adrià - Hydrocolloids

What is a Hydrocolloid?

A **hydrocolloid** is defined as a colloid system wherein the colloid particles are hydrophilic polymers dispersed in water. A hydrocolloid has colloid particles spread throughout water, and depending on the quantity of water available that can take place in different states. Hydrocolloids can be either irreversible (single-state) or reversible. Many hydrocolloids are derived from natural sources. For example, agar-agar and carrageenan are extracted from seaweed, gelatin is produced by hydrolysis of proteins of bovine and fish origins, and pectin is extracted from citrus peel and apple pomance. They have the ability to thicken and form gels at very low concentrations. Some can be used as whipping agents to make foams, and some act as emulsifiers. With the exception of gelatin (which is a protein), all hydrocolloids are polysaccharides, or complex sugars.

Characteristics of Gels

Thermo-reversible/Irreversible: *Thermo-reversible* gels melt when heated to a high enough temperature (with the exception of methylcellulose, which forms thermo-reversible gels that set when heated and melt when cooled). *Thermo-irreversible* gels will not melt when heated. Some gels are thermally reversible, but the melting temperature is so high that they don't melt in practice (high-acyl gellan).

Tendency for *Syneresis*: Syneresis occurs when liquid weeps out of a gel over time, as happens in custards. Agar is prone to syneresis; water can be expelled merely by pressing on it. Some gels only experience syneresis after long periods of time. Many gels that are ruined by freezing (see freeze-thaw stability, below) tend to weep when thawed. Within a given hydrocolloid system, harder gels tend to weep more than softer ones.

Freeze-thaw stability: Gels that may be frozen and thawed repeatedly are called freeze-thaw stable. Many gels begin to degrade after freezing; only one freeze-thaw cycle is advised. When an unstable gel is frozen and later thawed, its texture and structural may be compromised by the physical changes. To offset this effect and promote freeze-thaw stability, a second thickening hydrocolloid may be added to the gel system.

Clarity: The addition of some hydrocolloids yields gels that are more transparent than others.

Flavor release: Flavor release describes how well a gel expresses the flavorings with which it has been made. Flavor release is determined by many gel texture properties. Gelatin, for example, is considered to have excellent flavor release mainly because it melts in the mouth, whereas alginate is said to have poor flavor release because it tends to lock up flavors.

Shear reversibility: *Shear* is a force in which parallel objects move in opposite directions in a "sliding" motion, such as in the action of scissors cutting or a razor shaving. Stirring produces a shear, as does blending. Very fast blenders are called high-shear blenders. A shear-reversible gel will reform after it has been broken by a shear force. Most gels are not shear reversible.

Textures, Thickening, and Gelling

- **Hard/Soft**: How much force does it take to rupture the gel?
- **Brittle/Elastic or Springy**: Does the gel break suddenly or deform? After the first bite, does the gel return to its original height?
- **Cohesive**: Is the gel difficult to break up in the mouth? Does it stay together?
- **Gummy**: Is the gel hard and cohesive?
- **Chewy**: Is the gel both gummy and springy?
- **Adhesive**: Does the gel adhere to the teeth or palate?

Commonly used Hydrocolloids are classified in different groups according their origin and characteristics:

- **Gums:** These polysaccharides stabilize emulsions, retain moisture, thicken liquids and suspend particles.
  In frozen products, gums help prevent the formation of ice crystals. Gums are used to coat many "instant mixes" so that the mixes don't react with water from the air and become all globbed together.
  In medicine, gums are used to hold some tablets together (some grades of starch are also used for this purpose) and are also used to coat the little beads of medicine in "time release formulations" (they're not the only things used there, however). The gums keep the particles that are removed by grinding suspended and the particles are pumped out of the hole. Many of the gums used for these purposes are synthetically derived. The most important (and most expensive) plant gum is gum arabic or gum acacia that comes from *Acacia senegal*(and other species).

- **Pectins:** water soluble and make viscous solutions or gels, they also form gels under certain conditions. In plants, they are the materials that stick the plant cell walls together. For this purpose, pectin is often associated with calcium ions. There are also enzymes "pectinases" that degrade pectins. The number of methoxy groups present is important in determination of the properties of any particular pectin. As fruits mature, pectinases usually break down the pectins between cells and make the fruit soft and edible. The peels of many fruits serve as convenient sources of pectins. Most commercial pectins come from "apple pomace" or waste from manufacture of apple products (10-15% pectins), citrus wastes (20-30% pectins) and from sugar beet processing. Pectins are extracted by heating the plant materials in water (60-95 C) and at an acidic pH (2.5). The pectins are precipitated with ethanol and removed by centrifugation. Many candies (especially gum drops) involve pectins as a gelling agent. Also used in ice cream, cosmetics, adhesives, and in hardening steel. Used in many foods as a thickener and stabilizer.

TEXTURAS
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Hydrocolloid	Origin	Application	Characteristic of Gels	Gellification temperature	Thermal resistency
Gelly	Animal protein	Clarification of liquids, aspics, soft Gelatine blocks, gelees, marshmallows,	Melts at body temperature, not freeze-thaw stable, presents syneresis reversible gel.	20- 25 ºC	30 ºC
Agar	Red Seaweed		Creates soft to firm gels, presents syneresis, fast set gel, not freeze stable	43ºC	60 -70ºC
Iota	Irish moss	Setting milk base products, such as custards	soft gel with an elastic consistency, thermoreversible.	36ºC	60- 65ºC
Kappa	Irish moss	Quick gelatin coatings	Firm, soft and brittle thermoreversible gels. not suitable for making a gel from anything acidic	48ºC	60 º C
Xanthan Gum	Produced by bacteria	Thickener for salad dressings, sauces. Stabilizing emulsions, texturizing ice creams.	Transparent gel, resists low and high temperatures without modifying the texture.	-	-
Gellan	Produced by bacteria	Thickener, emulsifier, and stabilizer.	Firm clean cut gel that resists high temperatures. Not freezer stable.	85ºC	80 º C
Metil	Cellulose derived	To glue things together, to make fake meringues, to replace egg white.	Gels when heated. Freezes well.	50ºC	-
Algin	Brown Seaweed	Spherification, cake fillings.	Rigid brittle gels, not thermoreversible, forms gels in presence of calcium	-	-

SOLEGRAELLS
guzmán

Coco Colada

For the coconut semispheres
250g coconut purée
0.2 g of XANTANA

For the osmotised pineapple
200g pineapple
25g rum

For the chocolate-dipped coconut hemispheres
Coconut semispheres (see above)
100g cocoa butter
100g of 70% chocolate

Other ingredients
Fresh mint leaves

Preparation

- Coconut semispheres: Strain the coconut cream through a fine sieve. Add XANTANA and blend for 2 minutes in an electric blender until the mixture thickens and is totally smooth. Use a syringe to fill the hemispheric moulds. Freeze.
- Osmotised pineapple: Cut the pineapple into 0.5cm dice. Steep in rum for two hours. Strain and set aside.
- Chocolate-dipped coconut hemispheres: Melt the butter and dark chocolate in the microwave at full power. With a dipping fork, half-immerse the hemispheres in the chocolate so as to mimic the appearance of a halved coconut. Allow to crystallise and store in the freezer.

Finishing touches and presentation

- Serve the hemispheres on a chilled dish.
- Decorate with drained pineapple chunks and a sprig of mint.

Polenta Gnocchi

Ingredients for 4 servings

For the parmesan solution
500g grated Reggiano parmesan
450g water
0.2 g of XANTANA

For the spherical polenta gnocchi
175g water
25g cornmeal polenta
23g grated Reggiano parmesan
50g butter
7g olive oil (0.4° acidity)
3 g of GLUCO
2g salt
Bath
1000 g Water
5 g Algin

Other ingredients
Instant coffee
Fresh basil leaves

Preparation

1. Algin Bath: in 500 g of water, dissolve the algin with the help pf an immersion blender. Add the rest of water and mix. Leave it to rest for at least 4 hours.
2. Parmesan solution: In a saucepan heat the water to 90°C. Add the parmesan and stir with a spatula until it forms a cheese paste. Remove from heat, cover with cling film and allow to stand for 45 minutes. Strain and reserve the liquid.
3. Using a hand-held electric blender, hydrate the XANTANA in the resulting liquid. Blend for 1 minute and reserve until needed.
4. Spherical polenta gnocchi. Combine the polenta with the water and GLUCO and cook on medium heat, stirring constantly with a spatula. Once the mixture has come to a boil, cook for a further 3 minutes. Add the butter cut into pieces and the parmesan and stir until smooth. Remove from heat and gradually add the oil. Salt to taste.
5. Chill for one hour. Place in a piping bag with an 8mm nozzle. Squirt strips of gnocchi base into the ALGIN bath and cut with scissors at 2cm intervals. Leave in the bath for 1 minute. Retrieve from the bath and keep in a container filled with parmesan solution.
6. Finishing touches and presentation: Heat the spheres to 70°C in the parmesan solution. Remove the spheres from the solution with the slotted spoon and place six pieces on each plate. Drizzle with parmesan solution and lightly sprinkle with coffee. Decorate each
one with a basil leaf.